

## The effectiveness of reflexology in children with cerebral palsy with constipation

Effects of reflexology in cerebral palsy

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### Abstract

**Aim:** The aim of this study was to investigate the effects of reflexology on constipation severity, defecation frequency, pain and quality of life in the treatment of children with cerebral palsy (CP) with constipation. **Material and Method:** This study was conducted with a total of 50 SP children aged 4-12 years. The patients were randomized into two groups (n = 25), neurodevelopmental treatment with reflexology, and the other group (n = 25) only neurodevelopmental treatment. Reflexology and neurodevelopmental therapy were applied to all patients in each of the 2 groups, 2 sessions per week for 12 weeks. The functional levels of the patients were evaluated by the gross motor functional classification system. Bristol Stool Scale was used to assess the severity of constipation, Visual analog scale was used to assess pain during the defecation, WeeFIM was used to assess functional independence levels. P-value  $\leq 0.05$  was accepted as meaningful for all statistical levels. **Results:** The mean age of the patients was  $7.75 \pm 2.70$ . In the pre- and post-treatment evaluations, a statistically significant improvement was observed in the patients who underwent reflexology in all of the measurements of defecation frequency, stool score, pain and functional independence ( $p=0.023, 0.026, 0.025, 0.027$ ). However, only a significant improvement in pain assessment was found in the control group ( $p=0.046$ ). **Discussion:** As a result of the study, it was found that reflexology treatment applied to children with CP with constipation decreased the severity of pain during defecation with the severity of constipation and increased defecation frequency and functional independence level.

### Keywords

Reflexology; Cerebral Palsy; Constipation

DOI: 10.4328/ACAM.6173 Received: 19.01.2019 Accepted: 05.02.2019 Published Online: 11.02.2019 Printed: 01.03.2020 Ann Clin Anal Med 2020;11(2):120-124

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## Introduction

Cerebral palsy (CP) is a chronic disease characterized by non-progressive voluntary motor mobility with various medical problems. Constipation is one of the common gastrointestinal problems in children with cerebral palsy [1]. Constipation is seen in 74% of children with CP. The source of constipation is organic and secondary to extra-intestinal abnormalities. Dysphagia is seen as dry, insufficient water and food intake, as well as dysphagia, occurs due to inactivity and slow peristaltic movements of intestinal muscles. The probability of occurrence in quadriplegic type CPs is higher due to increased activity limitation and spasticity [2,3]. Constipation can be a chronic condition that causes social isolation by reducing the quality of life of both the family and the child. It causes complications such as megarectum, variation in bowel movement, soiling, and anal fissures with a lower quality of life if not treated in the early period [4]. Healthy children with regular intestinal movements often have defecation 3-4 times a week [5]. As seen in Park et al.'s study, children with SP have defecation frequency less than once a week or 10 days with longer colonic transit passage [6]. Brain damage in different studies has also been shown to cause gastrointestinal problems. Although dysphagia, vomiting, and constipation are common in children with neurological problems, constipation is the most common among them. Lifestyle and neurological factors such as malnutrition, increased extensor muscle tone or generalized hypotonus, musculoskeletal anomalies, decreased defecation and immobilization together with neurological factors constitute important risk factors for the occurrence of constipation in children with CP [7]. Among the children with CP, especially in patients with a quadriplegic and severe diplegic type involvement, gastrointestinal problems such as reduced quality of life and constipation are more common [8].

Effective bowel management program requires the recognition of predisposing factors and defecation problems in children with disabilities. Conservative methods of treatment of children with CP include pharmacological and non-pharmacological approaches. Stimulant medication and stool softeners help children by reducing symptoms but may cause some side effects. Side effects include colicky abdominal pain, bloating, flatulence, diarrhea, discomfort and nausea drug adverse effects (40.3%). Although physiotherapy methods such as reflexology, abdominal massage, electrical stimulation, biofeedback, exercise, connective tissue manipulation, banding can be used safely in the treatment, the number of studies related to these methods in literature is quite low [9]. Other conservative methods used in the treatment of constipation include intestinal massage, abdominal press, increasing water intake, increasing the use of vegetable oil in main meals, increasing fruit consumption, consuming fiber-rich foods and reducing the food that causes constipation [3].

Reflexology is one of the complementary treatment methods used in the treatment of children with CP. It is a massage technique applied to reference points in hands and feet that affect various parts of the body and visceral parts [10,11]. Reflexology is a technique applied by giving warnings to the trigger points on the feet, hands, and ears without any slider intermediate with hands within certain rules [12]. Reflexology has no known side effects. There are various studies on the historical development of reflexology. It was observed that the pressure applied to certain parts of the body caused anesthesia in certain parts of the hands and feet. These results are divided into 10 merid-

ians with 5 regions on each side of the body. These regions are associated with organs and have ended in the feet with the fingertips. Reflexology and meridian regions are incompatible according to modern reflexology, but the same energy blocks in both of them cause disease. As a result of this information, the external stimulus affects the central nervous system, improves homeostasis, regulates blood flow, provides relaxation and provides general well-being. For these reasons, the importance of reflexology has also increased in recent years and has created hope for families [13].

Few studies have investigated the efficacy of conservative treatment methods on constipation. Therefore, the aim of this study was to investigate the effects of reflexology on constipation severity, defecation frequency, pain, and quality of life in the treatment of children with CP with constipation.

## Material and Methods

### Participants:

This is a prospective randomized controlled trial conducted in Istanbul Mavi Pusula Special Education Center with 50 children over 4 years old with cerebral palsy diagnosed with chronic constipation according to Rome III criteria. The Rome III diagnostic criteria require 2 or more of the following complaints within the last 2 months: 2 or less defecation per week, having at least 1 fecal incontinence per week, history of excessive volitional stool retention or retentive posturing, history of painful or hard bowel movements, large fecal mass in the rectum, large diameter stools to prevent defecation [14]. Before initiating the study, the signed informed free consent forms were obtained from the enrolled subjects and families of the children. The approval of the Istanbul Bilgi University Clinical Investigations Ethics Committee was obtained with a decree number of 2018-40016-62 dated 2/5/2018.

Inclusion criteria included no surgical intervention in the last 6 months between 4-12 years of age, who had been diagnosed with chronic constipation according to the spastic type CP and Rome III criteria, with GMFCS levels 4 and 5 who had not used laxative medications and enemas for at least 4 weeks prior to the start of the treatment, patients who have not undergone complementary treatment methods such as botulinum toxin injection and reflexology. Exclusion criteria were congenital malformations, inflammatory and metabolic diseases in the gastrointestinal tract, active epileptic attack, dyskinetic, ataxic, and mixed type CP patients with impaired joint deformation to prevent reflexology.

### Intervention:

Patients were randomly divided into 2 groups of 25 people. A randomized list is prepared in a computer environment by a statistician for randomization. In this list, the odd numbers for the control group and the reflexology group were given double numbers. The group identification is printed on sequentially numbered cards placed in sealed envelopes. After enrollment, the numbered envelope was opened by the patient and the blind investigator. Neurodevelopmental therapy was applied to all patients in each of the 2 groups, 2 sessions per week for 12 weeks. In the neurodevelopmental therapy sessions, exercises were performed to provide normal motor development according to the current motor development levels of the patients. Duration of the session is 45 minutes.

Patients in the treatment group received reflexology in addition to neurodevelopmental treatment. Reflexology sessions were

also given as 24 sessions for 12 weeks in 2 sessions a week. Reflexology session time is 20 minutes. Reflexology application was cleaned every 2 feet. The therapist applied pressure to the reflex points at each of the 2 soles at the base of the right foot without using any intermediate. There are 6 different techniques applied in reflexology as follows: caterpillar, birds' beak, tornado, butterfly, hooking, and tearing. These techniques differ according to the finger movements of the therapist. In the caterpillar technique, the therapist's thumb moves by applying pressure up and down on the plantar side of the foot. In the beak technique, the therapist's thumb and forefinger make a pinch movement. In the tornado technique, the therapist's hand acts as a circular movement. In the butterfly technique, the therapist places his thumb on the flexed index finger and acts as a butterfly. In the hooking technique, the therapist applies pressure with the thumb and index finger. In the technique of tearing, the therapist applies a four-way pressure to the wider and deeper areas. The technique is selected according to the application area. Low pressure is applied to sensitive areas. In reflexology, the rule is to apply pressure with the thumb and index finger to increase the activation of weak areas. In this way, the stimulation of the surrounding tissues is achieved with more light and rapid movements [12]. In this study, rapid, light worm-like movements were applied to stimulate the gastrointestinal system instead of constant pressure. Slow and strong pressures are considered painkillers, while softer and faster movements are considered stimulants. The gastrointestinal and nervous system at the bottom of the foot is more stimulated for constipation therapy. Patients were given a cup of water to increase blood circulation and accelerate the removal of toxins after the session.

#### Assessment:

Age, gender, height, weight, body mass index and clinical involvement were recorded in all patients. The functional levels of the patients were evaluated by the gross motor functional classification system. Bristol Stool Scale was used to assess the severity of constipation, Visual analog scale was used to assess pain during the defecation, WeeFIM was used to assess functional independence levels.

*Gross Motor Function Classification System (GMFCS)* is a standard classification system for classifying the gross motor functions of children with CP. Palisano et al. (1997) developed a 5-level classification system. Level 1: Independent walk. There is a limitation in advanced gross motor skills. Level 2: Walk without aids. There is a limitation when walking in the community. Level 3: Walk with aids. There is a limitation when walking in the community. Level 4: Limitation. Self-mobilization. Moves in public or uses wheelchairs. Level 5: Mobilization is severely limited, although assistive technologies are used [15].

*The Bristol Stool Scale (BSS)* was developed by Lewis and Heaton at the University of Bristol in 1997 and categorizes the human feces in 7 groups. Fecal form varies according to the time in the column. Therefore, BSS is a fast and reliable indicator of transit time. Although not entirely scientific, this table helps health professionals to better understand the stool patterns when diagnosing. According to the BSS, Type 1: harder stools like nuts; Type 2: sausage-like, lumpy, hard; Type 3: sausage-like surface-slit, Type 4: like sausage or snake, but flat and smooth; Type 5: Soft drops with sharp edges; Type 6: embossed parts

with rough edges; Type 7: aqueous, no solids, completely liquid. According to the BSS 1-2 points are shown as "hard stool", 3-4-5 points "normal stool" and 6-7 points "soft-watery stool (diarrhea)" [16].

*Visual Analogue Scale (VAS)* was asked to mark a suitable point on a horizontal line with an actual length of 10 cm in order to determine the degree of impact of constipation severity and current conditions on individuals. "0" in terms of the influence of the current situation on the life: no effect on my life, "10" means living unbearable [17].

*Functional Independence Measure for Children (WeeFIM)* was developed to assess the functional independence of children aged from 6 months to 12 and Turkish validity and reliability made by Tur et al. [18]. WeeFIM includes a total of 18 items in 6 areas, including self-care, sphincter control, transfers, locomotion, communication, social and cognitive. When performing the function of each item in these areas, the score is scored from 1 to 7 depending on whether he/she has received help, on time, or if an auxiliary device is needed. When given task was completed with help, it is evaluated as 1, completely independent, 7 at the appropriate time and safely. Depending on the amount of help, points from 1 to 7 are given. According to this, at least 18 (full dependent), maximum 126 are fully independent points [19].

#### Statistical analysis

SPSS 22.0 program was used to analyze statistical data. Continuous and categorical data are reported as mean  $\pm$  standard deviation and number (percentages), respectively. Kolmogorov-Smirnov test was performed to determine the suitability of the data for normal distribution. Wilcoxon and Friedman K, Mann-Whitney U tests were used to compare the variables between the intra and inter groups. P-value  $\leq$  0.05 was accepted as meaningful for all statistical levels.

#### Results

The sociodemographic data of the patients (60% girl, 40% boy) were shown in Table 1. Although the distribution of inter-group patients was homogeneous, 9 of the patients with CP were severe diplegic and 16 were quadriplegic in the reflexology group; 10 patients had severe diplegic and 15 had quadriplegic in the control group involvement.

In the pre- and post-treatment evaluations, a statistically significant improvement was observed in the patients who underwent reflexology in all of the measurements of defecation frequency, stool score, pain and functional independence ( $p=0.023, 0.026, 0.025, 0.027$ ). However, only a significant improvement in pain assessment was found in the control group ( $p=0.046$ ). There was a statistically significant improvement in favor of reflexology group in all evaluations after intergroup treatment ( $p=0.003, 0.003, 0.004, 0.010$ ) (Table 2).

The correlation analysis of the post-treatment evaluations revealed no significant difference between the groups ( $p>0.05$ ) (Table 3).

#### Discussion

Many studies have included several methods for the treatment of children with constipation, but the number of studies investigating the efficacy of reflexology is quite low [20]. Therefore, the efficacy of reflexology on constipation, pain, and quality of life was investigated in this study. As a result of the study, it

**Table 1.** Sociodemographic characteristics of patients

	Reflexology group (n=25) Mean±SD	Control group (n=25) Median±SD	p
Age (year)	7.33±3.44	8.16±1.94	0.573
BMI (kg/m <sup>2</sup> )	18.89±9.58	17.46±1.53	0.831
GMFCS	4.50±0.54	4.66±0.51	0.575

Mann-Whitney U Test; BMI: Body mass index; GMFCS: Gross Motor Function Classification System; SD: Standard deviation; 1: Pre-treatment, 2: Post-treatment

**Table 2.** Comparison of stool scores before and after treatment between the groups

	Reflexology group (n=25) Mean±SD	Control group (n=25) Mean±SD	p
Defecation frequency 1	1.50±0.83	1.83±0.75	0.382
Defecation frequency 2	5.16±0.75	2.16±0.76	0.003*
p	0.023*	0.157	
Bristo Gaita Score 1	4.83±1.16	4.33±1.03	0.407
Bristo Gaita Score 2	1.66±0.51	4.16±0.75	0.003*
p	0.026*	0.317	
VAS 1	7.50±1.04	7.83±0.78	0.553
VAS 2	1.50±1.04	7.16±0.77	0.004*
p	0.025*	0.046*	
WeeFIM 1	24.66±3.98	23.66±3.55	0.575
WeeFIM 2	32.00±3.16	24.33±4.03	0.010*
p	0.027*	0.102	

\*p<0.05. Mann-Whitney U Test; Friedman K Test. VAS: Visual analog scale; WeeFIM: Functional independence measurement. SD: Standard deviation. 1: Pre-treatment, 2: Post-treatment

**Table 3.** Correlation between the groups stool score and defecation frequency, pain and functional independence

Spearman's rho			Defecation frequency	VAS	WeeFIM
Reflexology group	r		.224	.746	.414
	p	Bristo Gaita Score	.670	.088	.414
Control group	r		.583	-.767	.031
	p		.224	.075	.954

r: Spearman correlation test. VAS: Visual analog scale, WeeFIM: Functional independence measurement

was found that reflexology treatment applied to children with CP with constipation decreased the severity of pain during defecation with the severity of constipation and increased defecation frequency and functional independence level.

Constipation is more common in children with spastic type CP because it is frequently exposed in the presence of spasticity and adversely affects the quality of life [21]. Low ambulation ability in children with CP negatively affects digestive system and is one of the major causes of chronic constipation [20]. Parallel to the literature, the children who participated in this study were observed to have high disability levels as they were at GMFCS IV and V levels.

According to most studies, reflexology has been reported to stimulate the autonomic nervous system. It is thought to affect the body systems by increasing the activity of the parasympathetic system during the application. It has been shown to have an effect on the autonomic nervous system by means of baroreceptor reflex by affecting the heart rate and blood pressure val-

ues in healthy individuals when applied reflexology. The effect of reflexology on the autonomic nervous system supports nerve theory. The sensory nervous system is in the organization with the upper enters in brain such as hypothalamus, cortex, and amygdala. These centers include nuclei that affect the central nervous system, such as blood pressure, heart rate, and baroreceptor reflex [22]. In another study, the status of the heart was monitored by connecting the electrocardiogram to the patients during reflexology practice. The results of the study showed that reflexology affects the autonomic nervous system and changes the heart rate. Studies of different populations have been reported to have a sedative effect on stress and anxiety. In patients with cerebral palsy with constipation, reflexology facilitates parasympathetic activity and increases motility and provides defecation facilitation. In addition, it provides general relaxation in the body, lowers abdominal pressure, facilitates parasympathetic activity in the body, stimulates intestinal reflex points and increases intestinal function [23].

The mechanism of action of reflexology enables the patients to relax. Endorphins, known as endogenous opioids, are released when reflexology is applied. In addition, the endorphins are released with the chemical process in the plasma membrane due to the stimulation applied. Electrochemical nerve stimulation is activated when pressure is applied to reference points. In this way, reflexology improves healing and homeostatic balance. This improvement and pain relief is caused by increased blood flow and enkephalin release through pituitary gland stimulation [11]. Bishop et al. found that 50 children underwent 30 minutes of reflexology during 6 sessions and increased intestinal function [24]. Woodward et al. applied reflexology to 19 women for 6 weeks and reported that the defecation frequency increased and constipation decreased after the treatment [25]. As a result of this study, it was found 34% improvement in constipation severity of the patients receiving reflexology according to the Bristol Stool scale.

Health-related quality of life is a multidimensional concept and is an important outcome measure involving combined evaluation of main areas and indicators in clinical trials. Children with CP with constipation are more adversely affected by the quality of life than healthy people [26]. Constipation significantly reduces the quality of life of both children and families when seen in addition to other problems [20]. Faleiros et al. reported that in non-pharmacological conservative treatment of quadriplegic children with constipation, 90% or about 70% of patients recovered completely and improved quality of life [3]. Ozkan et al. applied reflexology for 20 minutes in 45 children with spastic type CP and improved their quality of life when compared to the placebo group compared to the WeeFIM questionnaire [27]. In another study by Ozkan et al., they reported a decrease in constipation and an increase in quality of life when they applied reflexology to 12 children with spastic type CP who were aged between 2 and 18 years [26]. In this study, when the quality of life and pain of the children were evaluated, it was determined that reflexology had a curative effect up to 20% in pain intensity and % 29 in life quality by decreasing constipation severity and symptoms.

One of the limitations of this study is that no comparison was made with sham reflexology. The second limitation is the low number of cases, the same therapist doing the treatment and evaluation. The third limitation is that the recovery is not physiologically evaluated. The fourth limitation is the lack of long-term follow-up with short-term effects. The fifth limitation is

that there is no comparison with children living in different regions.

### Conclusion

Reflexology is a safe method in constipation treatment. As a result of the study, it was found that reflexology treatment applied to children with CP with constipation decreased the severity of pain during defecation with the severity of constipation and increased defecation frequency and functional independence level. According to the results of this study, it has been shown that reflexology can be a part of the methods that can be included in the bowel rehabilitation program in the treatment of children with CP with constipation. It is recommended to use reflexology as a complementary treatment and to apply reflexology application absolutely in constipation treatment.

### Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

### Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Funding: None

### Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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### How to cite this article:

Tomris Duymaz. The effectiveness of reflexology in children with cerebral palsy with constipation. *Ann Clin Anal Med* 2020;11(2):120-124